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Revision 1
February 2004

U.S. Department of Energy
Idaho Operations Office

Long-Term Monitoring Plan for Operable Unit 3-13, Group 4 Perched Water

INEEL

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Idaho National Engineering

DOE/ID-10746
Revision 1
Project No. 15737

Long-Term Monitoring Plan for Operable Unit 3-13, Group 4 Perched Water

February 2004

Prepared for the
U.S. Department of Energy
Idaho Operations Office

ABSTRACT

This plan, together with the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Inactive Sites,* comprises the long-term perched water monitoring plan for Operable Unit 3-13, Group 4 Perched Water. The sampling and monitoring activities discussed include perched water sampling and monitoring of water levels and soil moisture. The data are being collected to determine the effectiveness of the Operable Unit 3-13, Group 4 Perched Water remedy. This plan is included as an appendix to the *Monitoring System and Installation Plan for Operable Unit 3-13, Group 4, Perched Water Well Installation*.

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ACRONYMS

bgs	below ground surface
BLR	Big Lost River
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CPP	Chemical Processing Plant
CS	Central Set
DOE	U.S. Department of Energy
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
FFA/CO	Federal Facility Agreement and Consent Order
FTL	field team leader
GDE	guide
HASP	Health and Safety Plan
ICPP	Idaho Chemical Processing Plant
ID	identification
IDEQ	Idaho Department of Environmental Quality
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LTMP	Long-Term Monitoring Plan
MSIP	Monitoring System and Installation Plan
MW	monitoring well
MWTS	Monitoring Well and Tracer Study
NA	not applicable
NE-ID	U.S. Department of Energy Idaho Operations Office
NIOSH	National Institute of Occupational Safety and Health

OU	operable unit
PP	Percolation Pond
PVC	polyvinyl chloride
PW	perched water
QA	quality assurance
QAPjP	Quality Assurance Project Plan
QC	quality control
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
SAP	Sampling and Analysis Plan
STL	Sewage Treatment Lagoon
TF	Tank Farm
USGS	United States Geological Survey
VOC	volatile organic compound
WAG	waste area group

Long-Term Monitoring Plan for Operable Unit 3-13, Group 4 Perched Water

1. INTRODUCTION

The Idaho National Engineering and Environmental Laboratory (INEEL) is divided into 10 waste area groups (WAGs) to better manage environmental operations mandated under the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991). The Idaho Nuclear Technology and Engineering Center (INTEC), formerly the Idaho Chemical Processing Plant (ICPP), is designated as WAG 3. Operable Unit (OU) 3-13 encompasses the entire INTEC facility.

Operable Unit 3-13 was investigated to identify potential contaminant releases and exposure pathways to the environment from individual sites as well as the cumulative effects of related sites. Ninety-nine release sites were identified in the *Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL—Part A, RI/BRA Report (Final)* (DOE-ID 1997) of which 46 were shown to have a potential risk to human health or the environment. A new operable unit, OU 3-14, was created to specifically address activities at the Tank Farm area where special actions will be required. The 46 sites were divided into seven groups based on similar media, contaminants of concern, accessibility, or geographic proximity. The *Final Record of Decision Idaho Nuclear Technology and Engineering Center, Operable Unit 3-13* (DOE-ID 1999) identifies remedial design/remedial action objectives for each of the seven groups. The seven groups include:

- Tank Farm Soils (Group 1)
- Soils under Buildings and Structures (Group 2)
- Other Surface Soils (Group 3)
- Perched Water (Group 4)
- Snake River Plain Aquifer (Group 5)
- Buried Gas Cylinders (Group 6)
- SFE-20 Hot Waste Tank System (Group 7).

In October 1999, the *Final Record of Decision Idaho Nuclear Technology and Engineering Center, Operable Unit 3-13* (DOE-ID 1999) was signed. This comprehensive Record of Decision (ROD) presents the selected remedial actions for the above groups. The remedy specified in the ROD for Group 4 is institutional controls with aquifer recharge control. The ROD also includes requirements for Group 4 perched water monitoring to assess the perched water drain-out and contaminant flux into the Snake River Plain Aquifer. Perched water monitoring reports are issued annually to report sampling and monitoring results and update contaminant distribution maps.

This Long-Term Monitoring Plan (LTMP) and the associated *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Inactive Sites* (DOE-ID 2002) are two of the appendices in the *Monitoring System and Installation Plan for Operable Unit 3-13, Group 4, Perched Water Well Installation* (DOE-ID 2003a). The Monitoring System and Installation Plan (DOE-ID 2003a) is the work plan for OU 3–13 Group 4 activities. Other appendixes to the Monitoring System and Installation Plan

(MSIP) include the *Field Sampling Plan for Operable Unit 3-13, Group 4, Perched Water Well Installation* (DOE-ID 2003b); the *Tracer Test Plan for Operable Unit 3-13 Group 4, Perched Water* (DOE-ID 2000a); the *Waste Management Plan for Operable Unit 3-13, Group 4, Perched Water* (DOE-ID 2003c); the *Health and Safety Plan for Operable Unit 3-13, Group 4, Perched Water Project* (INEEL 2002); the *Data Management Plan for Field and Nonchemical Data from the Operable Unit 3-13, Group 4 and Group 5, Well Installation and Monitoring Projects* (DOE-ID 2000b); and other documentation, including the Quality Level Designation, Spill Prevention/Response Plan, and the Storm Water Pollution Prevention Plan.

1.1 Purpose

The purpose of this plan is to guide the collection and analysis of perched water samples and vadose zone data to support the Group 4 OU 3-13 post-ROD monitoring at INTEC. Development of the LTMP is based on the data quality objectives (DQOs) found in the MSIP (DOE-ID 2003a).

1.2 Scope

The scope of this plan is to support implementation of the Phase II activities (long-term monitoring) and the DQOs, as specified in the MSIP, by providing the technical direction and methodology for routine perched water sampling and vadose zone monitoring at INTEC. Data and monitoring information collected under this plan will be used to support remedial action decisions as detailed in the MSIP Group 4 DQOs.

1.3 Regulatory Background

The OU 3-13 ROD (DOE-ID 1999) specified the remedy for the INTEC perched water system to be institutional controls and aquifer recharge control. The remedial actions chosen in the ROD are in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 USC § 9601 et seq.) as amended by the "Superfund Amendments and Reauthorization Act of 1986 (SARA)" (Public Law 99-499). In addition, remedies comply with the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300) and are intended to satisfy the requirements of the Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991)—Executive Order 12580. The U.S. Department of Energy Idaho Operations Office (NE-ID)[a] is the lead agency for remedy decisions. The U.S. Environmental Protection Agency (EPA) Region 10 and the Idaho Department of Environmental Quality (IDEQ) approve these decisions.

a. The abbreviation NE-ID signifies that the U.S. Department of Energy Idaho Operations Office (abbreviated as DOE-ID before October 1, 2003) reports to the DOE Office of Nuclear Energy, Science, and Technology.

2. SITE DESCRIPTION AND BACKGROUND

For a historical background description of the INEEL (Figure 2-1) and INTEC, refer to the Group 4 MSIP (DOE-ID 2003a) and the *Phase I Monitoring Well and Tracer Study Report for OU 3-13, Group 4, Perched Water* (DOE-ID 2003d). These documents provide comprehensive discussions about the background and operational processes, geology, hydrology, stratigraphy, and perched water conditions at INTEC. In addition, the Monitoring Well and Tracer Study (MWTS) Report details the results from Phase I of the Group 4 MSIP investigation, outlines the recommendations for Phase II monitoring, and summarizes the historical monitoring data for INTEC perched water wells.

2.1 Summary of Phase I Activities

The objective of Phase I was to collect data regarding the hydrologic system at INTEC before the percolation ponds at the southern boundary of INTEC were removed from service (August 26, 2002). The data collected established a baseline for comparison with data that have been collected after relocation of the new percolation ponds. A tracer study also was completed under Phase I to improve the understanding of the hydrologic conditions beneath INTEC.

Five new well sets consisting of twenty-one new monitoring wells were drilled between November 16, 2000, and March 30, 2001, as part of the Phase I drilling and well installation. The wells included instrumentation to evaluate the hydrologic connection between recharge sources surrounding INTEC and the perched water observed beneath it. Well sets constructed specifically for this investigation were identified as follows:

- Big Lost River (BLR) set
- Sewage treatment lagoon (STL) set
- Tank Farm (TF) set
- Central set (CS)
- Percolation pond (PP) set.

2.2 The 2003 Group 4 Monitoring System and Installation Plan Revision

Relocation of the percolation ponds in August 2002 resulted in a dramatic change in groundwater conditions in the southern part of INTEC; perched water levels in several monitoring wells have fallen markedly and many perched wells near the ICDF are now dry (see *Analysis of Perched Water Data from ICDF Monitoring Wells,* INEEL 2003). However, perched water levels in the central and northern portions of INTEC did not change significantly in response to the relocation of the percolation ponds. The INTEC vadose zone model had previously predicted some influence of the percolation ponds throughout the central and northern portions of INTEC. However, the model prediction was inconsistent with the site hydrogeologic conceptual model, which includes two relatively separate shallow perched water bodies beneath INTEC ("northern shallow perched" and "southern shallow perched," [see the MWTS report (DOE-ID 2000d, Section 2.4.2); and the OU 3-13 RI/FS report (DOE-ID 1997, Section 2.6)]).

The current conceptual model is further described in the Group 4 MSIP (DOE-ID 2003a). As a result, the Group 4 strategy and DQOs were revised to be consistent with the current conceptual model, and includes new tasks to monitor and evaluate the recharge and drain-out of INTEC perched water zones

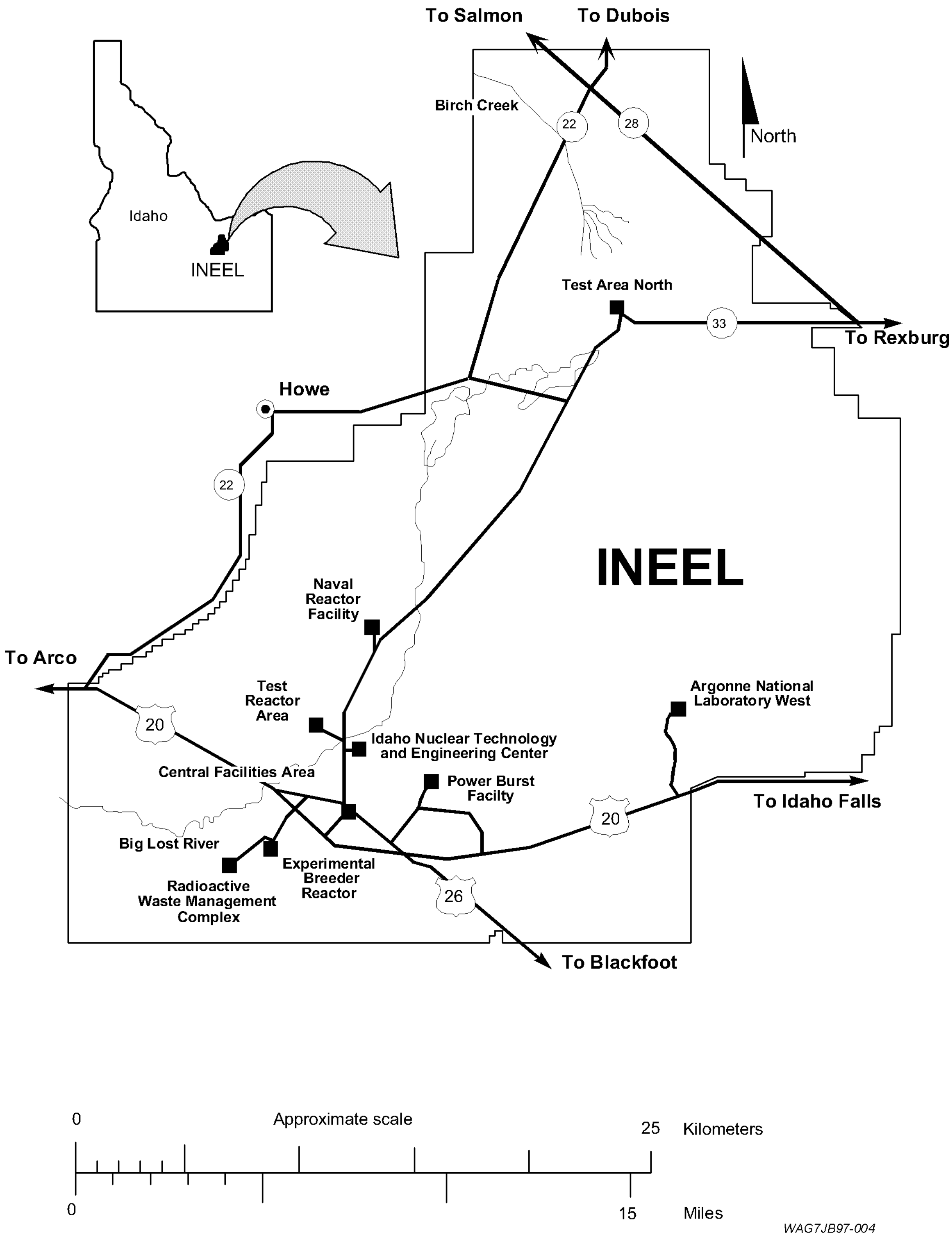

Figure 2-1. Map showing location of the Idaho Nuclear Technology and Engineering Center at the Idaho National Engineering and Environmental Laboratory.

in accordance with the OU 3-13 ROD (DOE-ID 1999). The Group 4 MSIP (DOE-ID 2003a) revision was issued to address the revised scope and the path forward that was negotiated with NE-ID, IDEQ, and EPA. The 2003 revision deferred the installation of Phase II well sets. New scope added under the revision included:

- **Installation of Additional Well Monitoring Instrumentation**—In 2003, additional datalogger instrumentation to record water depth, temperature, and electrical conductivity will be installed in perched water wells in and around the INTEC facility (see Section 4.1.4.1). The instruments monitor key perched water wells, provide data to distinguish between perched water recharge sources, and provide temporal and spatial correlation to specific recharge events.

- **Preparation of the *INTEC Water System Engineering Study*** (DOE-ID 2003e)—The engineering study had two primary goals: (1) determine if an appreciable quantity of water is leaking or being discharged from plant water systems that may be contributing to perched water recharge, and (2) provide recommendations for the identification, quantification, and minimization or elimination of such leaks or discharges.

- **Implementation of the *Field Sampling Plan for Operable Unit 3-13, Group 4, Geochemical Study for Perched Water Source Identification*** (DOE-ID 2003f)—The geochemical study is designed to monitor the influence from various potential sources of perched water and will include sample collection from potential water sources.

- **Implementation of the *Supplemental Work Plan for Tc-99 Evaluation in Groundwater, Waste Area Group 3, Group 4, Perched Water*** (ICP 2003)—The supplemental work plan was added to evaluate the elevated Tc-99 activity observed at the ICPP-MON-A-230 aquifer monitoring well at INTEC.

2.3 Contaminants of Concern

The contaminants of concern identified in the OU 3-13 WAG 3 baseline risk assessment are primarily radionuclides. The perched water contaminants of concern are strontium-90 (Sr-90), tritium (H-3), cesium-137 (Cs-137), iodine-129 (I-129), plutonium isotopes (Pu-238, -239, -240, and -241), uranium isotopes (U-234, -235, and -238), Np-237, Am-241, and Tc-99. In addition, mercury (Hg) was identified as a contaminant of concern. Contamination in the upper perched water resulted from contaminants being leached from surface sources, while contamination in the lower perched water resulted from a combination of injection well failures and contaminant migration.

During Phase I, samples were analyzed for volatile organic compounds (VOCs) associated with historic INTEC hazardous waste. When detected in samples, the VOCs were at concentrations below the maximum contaminant levels. Because of the low VOC concentrations and the absence of evidence that indicates VOCs will exceed maximum contaminant levels at a future date, analyzing samples for VOCs has been discontinued.

3. PERCHED WATER SAMPLING AND MONITORING DATA QUALITY OBJECTIVES

The Group 4 MSIP is the governing document for this LTMP. The reader is directed to the current revision of the Group 4 MSIP for the DQOs and DQO discussion. The Group 4 MSIP details the DQO's seven-step process and the design used for Group 4 activities to improve the effectiveness, efficiency, and defensibility of decisions used in the development of data collection designs. The seven-step process involves:

- Step 1: State the problem
- Step 2: Identify the decision
- Step 3: Identify the inputs to the decision
- Step 4: Define the study boundaries
- Step 5: Develop decision rules
- Step 6: Specify limits on the decision
- Step 7: Optimize the design for obtaining data.

If future revisions are made to the Group 4 MSIP DQOs that affect or change the strategies/activities outlined in this plan, this plan will be revised accordingly to meet the Group 4 MSIP DQOs.

4. FIELD ACTIVITIES

The Group 4 perched-water monitoring network (Table 4-1, Figure 4-1, and Figure 4-2) consists of a series of monitoring wells and instrumentation in the INTEC area used to measure and monitor hydrologic conditions. The various monitoring systems installed as part of the monitoring network include the following:

- **Monitoring wells** to monitor and sample perched water zones
- **Piezometers** constructed to measure static water levels
- **Suction lysimeters** to collect water samples from the unsaturated zone
- **Tensiometers and pressure transducers** to measure soil matric potential
- **Instrumentation and dataloggers** to measure/record matric potential, water level, temperature, and specific conductance.

Before commencing any sampling activities, a prejob briefing will be held with work-site personnel to review the requirements of the LTMP, Health and Safety Plan (HASP), and Waste Management Plan. At the conclusion of sampling, a postjob review will be conducted in accordance with applicable company procedures.

4.1 Sampling and Monitoring Activities

As was anticipated in the original revision of this LTMP, the sampling and monitoring locations, as well as data type(s), have evolved since Phase I activities were initiated in order to accommodate changing data needs and/or field conditions. This evolution will continue as new data needs or requirements are identified, new boreholes or wells are installed, or as field conditions change. Table 4-1 lists the locations currently planned for sampling and/or monitoring as part of this LTMP; Table 4-2 outlines the sampling and monitoring schedule; and Table 4-3 provides the analyte list.

4.1.1 Perched Water Sampling

Perched water samples will be collected from wells included in the perched-water well monitoring network that contain sufficient water (Table 4-1). If a sufficient amount of water is present in the perched well, samples will be collected for all the analytes listed in Table 4-3. As already encountered in previous sampling events, it will not be possible to collect samples from many locations because the wells have permanently, temporarily, or seasonally gone dry. In wells with poor recovery where only partial sample sets can be collected, contaminants of concern will have priority. Details for well and borehole completions in the monitoring network are detailed in the MWTS Report (DOE-ID 2003d).

4.1.2 Suction Lysimeter Sampling

Samples will be collected from functioning suction lysimeters installed at each well set as part of the Phase I activities (see the MWTS Report [DOE-ID 2003d]). In addition, functioning lysimeters located inside the Tank Farm (A-series lysimeters) will be sampled. Because a limited sample volume will be available from the lysimeters, a priority list for the analytes will need to be established before each sampling event.

Table 4-1. Group 4 Idaho Nuclear Technology and Engineering Center perched water monitoring wells and lysimeters.[a]

Well Name	Well Alias	Well ID	Casing Diameter (in.)	Total Depth Drilled (ft bgs)	Well Screen Material	Well Screen (ft bgs)	Depth of Lysimeters/Tensiometers (ft bgs)
CPP-33-1	33-1	735	2	113.6	SS	89 to 99	—
CPP-33-2	33-2	736	2	114.8	SS	85.8 to 105.8	—
CPP-33-3	33-3	737	2	126.4	SS	111.8 to 122.0	—
CPP-33-4-1	33-4-1	764	2	124	SS	98.2 to 118.5	—
CPP-33-4-2	33-4-2	720	2	34	SS	20.5 to 30.7	—
CPP-37-4	37-4	806	2	113.4	SS	99.9 to 109.9	—
CPP-55-06	55-06	131	2	114.6	SS	93.1 to 113.1	—
INTEC-MON-P-001	MW-1-4	1057	4	336.3	PVC	326 to 336	—
INTEC-MON-P-001	MW-1-1	1057	1	368.3	PVC	359 to 369	—
INTEC-MON-P-002	MW-2	1058	2	112.3	PVC	102 to 112	—
INTEC-MON-P-003	MW-3-2	1059	2	138.3	PVC	128 to 138	—
INTEC-MON-P-003	MW-3-1	1059	1	119	PVC	116.3 to 118	—
INTEC-MON-P-004	MW-4-2	1060	2	110.8	PVC	100.6 to 110.6	—
INTEC-MON-P-004	MW-4-1	1060	1	130.7	PVC	128 to 129.7	—
INTEC-MON-P-005	MW-5-2	1061	2	126.7	SS	106.5 to 126.5	—
INTEC-MON-P-005	MW-5-1	1061	1	83.7	PVC	81.0 to 82.7	—
INTEC-MON-P-006	MW-6	1062	2	137	PVC	117 to 137	—
INTEC MON-P-007	MW-7-1	1063	1	105	PVC	102.3 to 104	—
INTEC-MON-P-007	MW-7-2	1063	2	142.3	PVC	132 to 142	—
INTEC-MON-P-008	MW-8	1064	2	127	PVC	115 to 125	—
INTEC-MON-P-009	MW-9-2	1065	2	132	PVC	120 to 130	—
INTEC-MON-P-009	MW-9-1	1065	1	108	PVC	104.2 to 105.7	—
INTEC-MON-P-010	MW-10-1	1066	1	78.2	PVC	76.5 to 78	—
INTEC-MON-P-010	MW-10-2	1066	2	152	PVC	141 to 151	—
INTEC-MON-P-011	MW-11-1	1067	1	116	PVC	112 to 113.5	—

Table 4-1. (continued).

Well Name	Well Alias	Well ID	Casing Diameter (in.)	Total Depth Drilled (ft bgs)	Well Screen Material	Well Screen (ft bgs)	Depth of Lysimeters/Tensiometers (ft bgs)
INTEC-MON-P-011	MW-11-2	1067	2	138	PVC	131 to 136	—
INTEC-MON-P-013[b]	MW-12-2	1068	2	113.5	PVC	109 to 119	—
INTEC-MON-P-013[b]	MW-12-1	1068	1	151.75	PVC	148.6 to 150.3	—
INTEC-MON-P-014[b]	MW-13	1069	2	105.4	PVC	100 to 105	—
INTEC-MON-P-015[b]	MW-14	1070	2	104	PVC	94 to 104	—
INTEC-MON-P-016[b]	MW-15	1071	2	131.6	PVC	111.3 to 131.3	—
INTEC-MON-P-017[b]	MW-16	1072	2	112.2	PVC	97 to 107	—
INTEC-MON-P-018[b]	MW-17-2	1073	2	193.3	PVC	181.7 to 191.7	—
INTEC-MON-P-018[b]	MW-17-2	1073	1.25	274	PVC	263.8 to 273.8	—
INTEC-MON-P-018[b]	MW-17-4	1073	Open hole	381	Open hole	360 to 381	—
INTEC-MON-P-019[b]	MW-18-2	1087	2	124.2	PVC	113.5 to 123.5	—
INTEC-MON-P-019[b]	MW-18-1	1087	1.25	412	PVC	394 to 414	—
INTEC-MON-P-020	MW-20-1	1074	1	106.7	PVC	96 to 106	—
INTEC-MON-P-020	MW-20-2	1074	2	151.5	PVC	133.2 to 148.4	—
INTEC-MON-P-024	MW-24	1093	4	123	SS	53.5 to 73.5	—
PW-1	PW-1	257	6	120	Steel	100 to 120	—
PW-2	PW-2	258	6	131	Steel	111 to 131	—
PW-3	PW-3	259	6	125	Steel	103 to 123	—
PW-4	PW-4	260	6	150	Steel	110 to 150	—
PW-5	PW-5	261	6	131	Steel	109 to 129	—
PW-6	PW-6	262	6	130	Steel	105 to 125	—
USGS-050	USGS-050	499	Open hole	405	Open hole	357 to 405	—
ICPP-SCI-P-216	BLR-AL	1428	1.25	37	PVC	35.4 to 35.9	Lysimeter (32.3) Tensiometer (32.9)
ICPP-SCI-P-217	BLR-SP	1429	1	180.5	PVC	140.0 to 145.5	Lysimeter (166.8) Tensiometer (132.5) (166.8)

Table 4-1. (continued).

Well Name	Well Alias	Well ID	Casing Diameter (in.)	Total Depth Drilled (ft bgs)	Well Screen Material	Well Screen (ft bgs)	Depth of Lysimeters/Tensiometers (ft bgs)
ICPP-SCI-P-218	BLR-DP	1430	4	400	SS	375 to 385	Lysimeter (352) Tensiometer (352) (395)
ICPP-SCI-P-248	BLR-CH	1444	2	414.7	SS	120 to 130	—
ICPP-SCI-P-219	STL-AL	1437	1.25	31.5	PVC	30.4 to 30.9	Lysimeter (26) Tensiometer (26.5)
ICPP-SCI-P-220	STL-SP	1438	2	170	PVC	NA	Lysimeter (103.3) Tensiometer (103.5) (146)
ICPP-SCI-P-221	STL-DP	1443	4	440	SS	429 to 439	Lysimeter (416) Tensiometer (384.5) (416)
ICPP-SCI-P-251	STL-CH-1	1445	1	451	PVC	99 to 109	—
ICPP-SCI-P-251	STL-CH-2	1445	2	451	SS	140 to 145	—
ICPP-SCI-P-222	PP-AL	1434	1.25	33	PVC	30.8 to 31.3	Lysimeter (26.6) Tensiometer (27.4)
ICPP-SCI-P-223	PP-SP	1435	1	193	PVC	180 to 182	Lysimeter (108.8) (169) Tensiometer (108.8) (131.5) (169)
ICPP-SCI-P-224	PP-DP-1	1436	1	398	PVC	50 to 55	—
ICPP-SCI-P-224	PP-DP-4	1436	4	398	SS	372 to 382	Lysimeter (383) Tensiometer (263.5) (383)
ICPP-SCI-P-250	PP-CH-1	1446	1	414.8	PVC	187 to 192	—
ICPP-SCI-P-250	PP-CH-2	1446	2	414.8	SS	235 to 255	—
ICPP-SCI-P-247	CS-AL	1433	1.25	58	PVC	46.0 to 46.5	Lysimeter (40.9) Tensiometer (41.5)
ICPP-SCI-P-225	CS-SP	1431	1	167	PVC	159 to 164	Lysimeter (122) (155) Tensiometer (122) (155)
ICPP-SCI-P-226	CS-DP-1	1432	1.25	405	PVC	288.5 to 193	Lysimeter (280) Tensiometer (280) (287)
ICPP-SCI-P-226	CS-DP-2	1432	4	405	SS	368 to 378	—
ICPP-SCI-P-249	CS-CH	1447	2	402	SS	188.5 to 198.5	—
ICPP-SCI-P-227	TF-AL	1439	1.25	42.5	PVC	37.5 to 38.0	Lysimeter (35) Tensiometer (35)

Table 4-1. (continued).

Well Name	Well Alias	Well ID	Casing Diameter (in.)	Total Depth Drilled (ft bgs)	Well Screen Material	Well Screen (ft bgs)	Depth of Lysimeters/Tensiometers (ft bgs)
ICPP-SCI-P-228	TF-SP	1397	1	202	PVC	145 to 150	Lysimeter (118) Tensiometer (118) (157) (173)
ICPP-SCI-P-229	TF-DP	1441	4	398	SS	375 to 385	Lysimeter (389) Tensiometer (350.5) (389)
ICPP-SCI-P-252	TF-CH	1448	2	325	SS	145 to 150	—
			A-60 LYSIMETER SET				
ICPP-SCI-S-125	A-60	1229	NA	40.3	NA	NA	Lysimeter (39.1)
ICPP-SCI-S-127	A-62	1231	NA	42.8	NA	NA	Lysimeter (41.1)
ICPP-SCI-S-128	A-63	1232	NA	46.5	NA	NA	Lysimeter (44.7)
ICPP-SCI-S-129	A-64	1233	NA	42.2	NA	NA	Lysimeter (39.8)
ICPP-SCI-S-131	A-65	1235	NA	39.2	NA	NA	Lysimeter (36.4)

a. Details for well and borehole completions in the monitoring network are detailed in the *Phase I Monitoring Well and Tracer Study Report for OU 3-13, Group 4, Perched Water* (DOE-ID 2003d).
b. For these wells, the "Well Name" does not directly correspond with the "Well Alias" (previous documents have been inconsistent in noting this discrepancy). For the purpose of Group 4 sampling events, the "Well Alias" name will continue to be used as the identifier in discussions and on maps, as has been done traditionally.

bgs = below ground surface
BLR = Big Lost River
CPP = Chemical Processing Plant
CS = Central Set
ICPP = Idaho Chemical Processing Plant
INTEC = Idaho Nuclear Technology and Engineering Center
MW = monitoring well
NA = not applicable
PP = Percolation Pond
PVC = polyvinyl chloride
PW = perched water
STL = Sewage Treatment Lagoon
TF = Tank Farm
USGS = United States Geological Survey

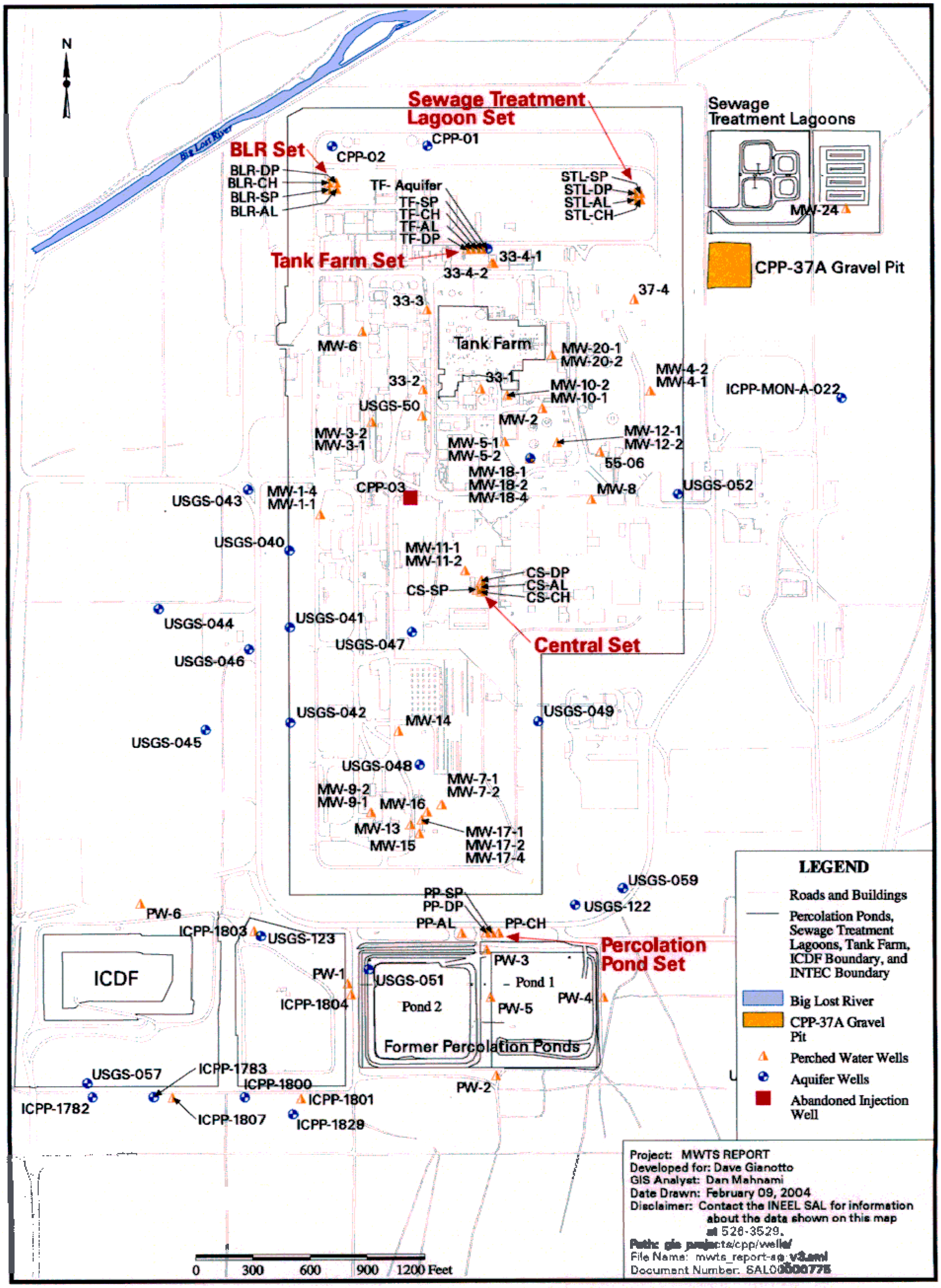

Figure 4-1. Map of Idaho National Technology and Engineering Center showing existing well locations.

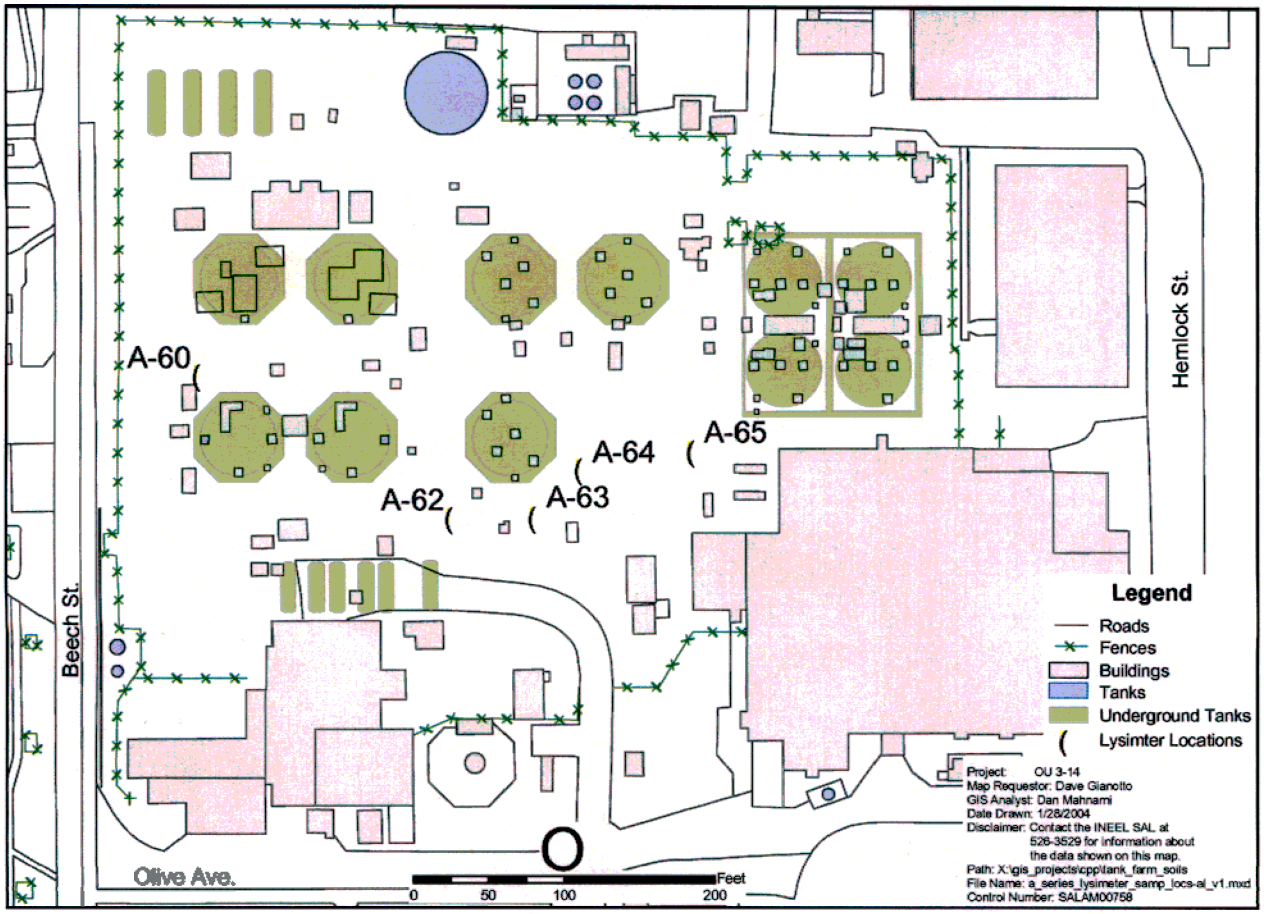

Figure 4-2. A-60 series lysimeters, planned for long-term monitoring, located inside the Idaho National Technology and Engineering Center Tank Farm.

Table 4-2. Group 4 perched water sampling and monitoring frequency.

Sampling or Monitoring Activity	Phase IIa[a] Frequency (Years 1 through 5)	Phase IIb[a] Frequency (Years 6 through 20)
Perched Water and Lysimeter Sampling	Annual (2003[b], 2004, 2005, 2006, and 2007)	5 years (2012, 2017, and 2022)
Matric Potential Measurements	Daily[c]	Daily[c]
Water Level Measurements	Manual measurements: monthly Automated measurements: daily[d]	Manual measurements: TBD[c] Automated measurements: daily[d]

a. Phase IIa refers to the 5-year interval following the August 26, 2002, percolation pond relocation; Phase IIb refers to years 6 through 20 following percolation pond relocation. The final decision on the frequency of sampling will be made after reviewing the data collected during years 1 through 5.

b. The 2003 annual sampling event was conducted under the *Field Sampling Plan for Operable Unit 3-13, Group 4, Perched Water Well Installation* (DOE-ID 2003b).

c. To be determined—the frequency of manual water level measurements will be determined at the conclusion of the Year 5 review.

d. Measurements will be collected with automated equipment (dataloggers) and will be downloaded quarterly.

Table 4-3. Perched water analytes for long-term monitoring.

Radiochemistry	Target Analyte List Metals[a]		Anions	Other Laboratory Analyses	Field Measurement Parameters
Gross alpha	Aluminum	Lead	Chloride	Carbon-14[b]	Temperature
Gross beta	Antimony	Magnesium	Bromide	Alkalinity	pH
Gamma Spec.[c]	Arsenic	Manganese	Fluoride	Total dissolved solids	Specific conductance
Plutonium isotopes*	Barium	Mercury*	Nitrate		
Uranium isotopes*	Beryllium	Nickel	Sulfate		
Americium-241*	Boron	Potassium			
Iodine-129*	Cadmium	Selenium			
Neptunium-237*	Calcium	Silver			
Strontium-90*	Chromium	Thallium			
Technetium-99*	Cobalt	Uranium			
Tritium*	Copper	Vanadium			
	Iron	Zinc			

* Denotes the contaminants of concern identified in the Operable Unit 3-13 Waste Area Group 3 baseline risk assessment.
a. Both filtered (dissolved) and unfiltered (total) samples will be collected.
b. One-time analyses planned for 2004 sampling event only.
c. Includes Cs-137

4.1.3 Soil Matric Potential Monitoring

Tensiometers and pressure transducers (Model 15–Electronic Engineering Innovations, Inc.) are installed to measure the matric potential (negative pressure head) of the vadose zone (under unsaturated conditions) or the pressure head if saturated conditions exist. At each Phase I well set, tensiometers and pressure transducers are electronically connected to a Campbell Scientific CR23X Micrologger® (datalogger). Data will be downloaded from the dataloggers on a quarterly basis.

4.1.4 Water Level Monitoring

4.1.4.1 Automated Water Level Measurements. To date, two types of pressure transducers/dataloggers are being used to monitor water levels (In-Situ Minitrolls® and Solinst Leveloggers®). Data will be downloaded from dataloggers on a quarterly basis. The locations, and the type of datalogger installed, vary as monitoring needs and maintenance requirements change. Currently, there are 30 water level dataloggers installed in various perched water monitoring wells.

4.1.4.2 Manual Water Level Measurements. Manual water level measurements will be collected from perched wells on a monthly basis until Year 5. After Year 5, the frequency of manual water level measurements will be determined in the Year 5 review (Table 4-2).

4.1.5 Other Monitoring Activities

In addition to water level monitoring, the In-Situ Minitrolls® record water temperature and the Solinst Leveloggers® record water temperature and specific conductance. The data will be downloaded from the dataloggers on a quarterly basis.

4.2 Sampling and Monitoring Schedule

Phase IIa calls for 5 consecutive years of annual sampling and monitoring after relocation of the INTEC percolation ponds. The first year (Year 1) of sampling occurred in 2003 and Year 5 will be in 2007. After Year 5, current plans call for sampling to occur every 5 years. The final decision on the frequency of sampling will be made after reviewing the data collected during years 1 through 5. Table 4-2 lists the sampling and monitoring schedule for Phase II monitoring under this LTMP.

4.3 Analyte List

Table 4-3 outlines the anticipated analytes and water quality parameters planned for long-term monitoring.

4.4 Well Maintenance

Maintenance of the Group 4 wells and the associated equipment is needed to ensure continued well access and data collection. Well maintenance activities conducted under this plan include (but are not limited to) the repair/replacement of well pumps and casings, instrumentation, cables, surface pads, well locks, and well covers. These maintenance activities are performed in accordance with Plan (PLN) -758, "Idaho National Engineering and Environmental Laboratory Sitewide Well Maintenance Plan." The waste generated during well maintenance activities will be handled as CERCLA waste in accordance with Section 10 of this plan.

5. SAMPLING AND MONITORING PROCEDURES

This section describes the sampling and monitoring procedures and equipment to be used for the planned perched water monitoring.

5.1 Depth to Water

Perched water levels (depth to water) will be measured before sampling using either an electronic measuring tape (Solinst brand or equivalent) or a steel-type measure, as described in Guide (GDE) -128, "Measuring Groundwater Levels." Measurement of all perched water levels will be recorded to the nearest 0.01 ft.

5.2 Well Purging

All perched water wells that have sufficient water will be purged before sample collection. During the purging operation, a Hydrolab (or equivalent) will be used to measure specific conductance, pH, and temperature. Well-purging procedures are provided in GDE-127, "Sampling Groundwater." Samples for water quality analysis can be collected after a minimum of three well casing volumes of water have been purged from the well and when three consecutive water quality parameter measurements are within the following limits:

- pH ± 0.1
- Temperature ± 0.5°C
- Specific conductance ± 10 μmhos/cm.

Some of the perched wells may have inadequate yields to supply sufficient purge volume. In that case, the well should be purged to dryness and sampled the next working day. At that point, samples should be collected as directed in GDE-127.

5.3 Perched Water Sampling

All nondedicated sampling equipment that contacts the water sample will be cleaned following the procedure outlined in GDE-140, "Decontaminating Sampling Equipment." After water level measurements and well purging is complete, perched water samples will be collected for analyses, as outlined in the Sampling and Analysis Plan (SAP) tables. The requirements for containers, preservation methods, sample volumes, holding times, and analytical methods are listed in the Quality Assurance Project Plan (QAPjP) (DOE-ID 2002) and laboratory statement of work.

Sample bottles for perched water samples will be filled to approximately 90 to 95% of capacity to allow for content expansion or preservation. Filtered samples will be for Target Analyte List metal and will be passed through a 0.45-μm in-line filter. Samples requiring acidification will be acidified to a pH <2 using ultra pure nitric acid. The preferred order for sample collection will be determined based on data needs.

5.4 Suction Lysimeter Sampling

The sampling procedure for lysimeter sampling is delineated in Technical Procedure (TPR) -6572 "Installing Lysimeters and Sampling Soil Pore Water." Depending on the type of lysimeter, sample volumes are either ≤500 mL or ≤1,000 mL. Because of the limited sample volumes, field parameters may not be measured and contaminants of concern will have priority for analysis.

5.5 Perched Water Monitoring

Monitoring activities include the automated measurements of matric potential, perched water levels, water temperature, and specific conductance. Various types of probes and instruments are used to collect and store the data. The operation, calibration, and maintenance of monitoring instrumentation (dataloggers, sensors, and probes) will be performed in accordance with the manufacturer's recommendations.

6. SAMPLE CONTROL

Sample control ensures that unique sample identifiers are used for each sample. It also covers the documentation of sample collection information so that a sampling event may be reconstructed later.

The INEEL Sampling and Analysis Management group will use a systematic character identification (ID) code to uniquely identify all samples. Uniqueness is required to maintain consistency and prevent the same ID code from being assigned to more than one sample.

A SAP table/database will be generated for each sampling event to record all pertinent information (well designation, media, date) associated with each sample ID code.

The QAPjP (DOE-ID 2002) outlines the requirements and procedures for sample handling, chain of custody, sample preservation, sample packaging, radiological screening of samples, and the transportation and shipment of samples.

7. QUALITY ASSURANCE/QUALITY CONTROL

The QAPjP (DOE-ID 2002) provides an extensive discussion about the quality assurance/quality control (QA/QC) protocols used to achieve project quality objectives. This section details the field elements of the QAPjP to support field operations during the perched water sampling and monitoring.

7.1 Project Quality Objectives

The QA objectives specify what measurements must be met to produce acceptable data for a project. The technical and statistical qualities of these measurements must be properly documented. Precision, accuracy, and completeness are quantitative parameters that must be specified for physical/chemical measurements. Comparability and representativeness are qualitative parameters.

The QA objectives for this project will be met through a combination of field and laboratory checks. Field checks will consist of collecting field duplicates, equipment blanks, and field blanks. Laboratory checks consist of initial and continuing calibration samples, laboratory control samples, matrix spikes, and matrix spike duplicates. Laboratory QA is detailed in the QAPjP (DOE-ID 2002) and is beyond the scope of this LTMP.

7.1.1 Field Precision

Field precision is a measure of the variability not due to laboratory or analytical methods. The three types of field variability or heterogeneity are spatially within a data population, between individual samples, and within an individual sample. Although the heterogeneity between and within samples can be evaluated using duplicate and/or sample splits, overall field precision will be calculated as the relative percent difference between two measurements or relative standard deviation between three or more measurements. The relative percent difference or relative standard deviation will be calculated as indicated in the QAPjP (DOE-ID 2002) for duplicate samples during the data validation process.

Duplicate samples to assess precision will be collocated and collected by field personnel at a minimum frequency of one duplicate for every 20 samples or one duplicate sample per well set, whichever is less.

7.1.2 Field Accuracy

Cross-contamination of samples during collection or shipment could yield incorrect analytical results. To assess the occurrence of any cross-contamination events, field blanks will be collected to evaluate any potential impacts. The goal of the sampling program is to eliminate any cross-contamination associated with sample collection or shipment. To assess precision, duplicate samples will be collocated and collected by field personnel at a minimum frequency of one duplicate for every 20 samples or one duplicate sample per well set, whichever is less. Accuracy of field instrumentation can be maintained by calibrating all instruments used to collect data and crosschecking with other independently collected data.

7.1.3 Representativeness

Representativeness is evaluated by assessing the accuracy and precision of the sampling program and expressing the degree to which samples represent actual site conditions. In essence, representativeness is a qualitative parameter that addresses whether the sampling program was properly designed to meet the DQOs. The representativeness criterion is best satisfied by confirming that sampling locations are selected properly and a sufficient number of samples are collected to meet the requirements stated in the DQOs.

7.1.4 Comparability

Comparability is a qualitative measure of the confidence with which one data set can be compared to another. These data sets include data generated by different laboratories performing this work, data generated by laboratories in previous studies, data generated by the same laboratory over a period of several years, or data obtained using different sampling techniques or analytical protocols. For field aspects of this program, data comparability will be achieved using standard methods of sample collection and handling. Data collection frequency and long-term trends will ensure comparability of monitoring data.

7.1.5 Completeness

Field completeness will be assessed by comparing the number of samples collected to the number of samples planned. Field sampling completeness is affected by such factors as equipment and instrument malfunctions and insufficient sample recovery. Completeness can be assessed following data validation and reduction. The completeness goal for this project is 100% for critical activities and 90% for noncritical activities. The completion of annual well sampling and monitoring is considered critical, while the collection of individual samples and data points is not critical.

7.2 Field Data Reduction

The reduction of field data is an important task to ensure that errors in sample labeling and documentation have not been made. This includes cross-referencing the SAP table with sample labels, logbooks, and chain-of-custody forms. Before sample shipment to the laboratory, field personnel will ensure that all field information is properly documented.

7.3 Data Validation

All laboratory-generated data will be validated to Level A, as outlined and defined in the QAPjP (DOE-ID 2002). Field-generated data (e.g., matric potential, moisture measurements, and water levels) will be validated through the use of properly calibrated instrumentation, comparing and crosschecking data with independently gathered data, and recording data collection activities in a logbook.

8. DATA MANAGEMENT/ANALYSIS AND UNUSUAL OCCURRENCES

8.1 Data Management and Analysis

Two types of data are being collected under this LTMP: (1) laboratory analytical (chemical) data from perched water sampling and (2) field data that are collected manually and automatically.

For analytical/chemical data, the QAPjP (DOE-ID 2002) outlines the requirements and processes to generate, validate, interpret, track, store, and retrieve data at the INEEL. This project will work with the INEEL Sample and Analysis Management Program to manage and assess laboratory analytical data.

Field data include manual water level measurements, automated dataloggers for matric potential, water levels, temperature, specific conductance, and other field observations. These data will be managed according to the applicable requirements specified in the Data Management Plan (DOE-ID 2000b). Field data will be analyzed using methods that are appropriate for the data types and specific field conditions. Some data sets may be filtered. Analysis will include recognized methods and techniques that are used with the specific data types, which may include statistical processes.

8.2 Unusual Occurrences

Unusual occurrences are situations that are unforeseen, unanticipated, or unexpected. They may occur in chemical data sets or as field-related data and observations. An example of an unusual occurrence is detection of a contaminant of concern where previously it was undetected.

The following is meant to provide a process for resolving an unusual occurrence rather than a method for dealing with each specific unusual occurrence. The following steps will be taken to resolve an unusual occurrence:

- Record the unusual occurrence and supporting observations in the field logbook
- Validate (confirm) the unusual occurrence (e.g., reanalyze the sample if there is any remaining) and report to the program manager as soon as possible
- Determine if the occurrence is a one-time event or is recurring
- If the unusual occurrence is of a significant nature (significant is anything that can potentially increase contaminant flux to the aquifer with concentration levels above maximum contaminant levels [e.g., increasing water-level trends]), it will be reported to the appropriate program managers
- If the unusual occurrence is not of a significant nature (e.g., a malfunctioning instrument that is reporting increases in water levels), it will be resolved by the technical leader
- Take appropriate action for significant unusual occurrences, which may include increasing sampling and/or monitoring frequency or reviewing the ROD for implementation of a remedial action.

9. PROJECT ORGANIZATION AND RESPONSIBILITIES

The organizational structure for this project reflects the resources and expertise required to perform the work while minimizing the risks to worker health and safety. As outlined in the FFA/CO (DOE-ID 1991), each of the three signatory agencies (NE-ID, EPA, and IDEQ) has assigned a WAG project manager. The WAG project manager's responsibility is to oversee the effective implementation of actions stated in final action documents (i.e., the OU 3-13 ROD [DOE-ID 1999]). The *Health and Safety Plan for Operable Unit 3-13, Group 4, Perched Water Project* (INEEL 2002) outlines the responsibilities of key project and work-site personnel.

10. WASTE MANAGEMENT

All waste will be managed in accordance with the Waste Management Plan (DOE-ID 2003c). Waste generated during the OU 3-13, Group 4 long-term monitoring may include the following:

- Contaminated personal protective equipment, wipes, bags, and other refuse
- Well purge water
- Aqueous decontamination solutions
- Used sample containers and disposable sampling equipment
- Materials from well maintenance and repairs.

11. HEALTH AND SAFETY

A project-specific HASP (INEEL 2002) has been prepared to define the health and safety requirements for this project. This HASP establishes the procedures and requirements used to minimize health and safety risks to persons working on the OU 3-13 Perched Water Project. The HASP meets the requirements of 29 CFR 1910.120 and 29 CFR 1926.65, "Hazardous Waste Operations and Emergency Response." The document is consistent with information found in the following references:

- *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH 1985)

- Company manuals.

The HASP complies with the authorized safety basis detailed in INTEC's authorized safety basis and "Other Industrial" classification in accordance with the applicable preliminary hazard assessment, auditable safety analysis, or safety analysis report (if applicable).

12. DOCUMENT MANAGEMENT

This section summarizes document management and sample control. Documentation includes field logbooks used to record field data and sampling procedures, chain-of-custody forms, and sample container labels. The analytical results from this field investigation will be documented in reports and used as input for refining the current conditions for the computer model.

12.1 Documentation

The field team leader (FTL) will be responsible for controlling and maintaining all field documents and records, and for verifying that all required documents to be submitted to the Sample and Analysis Management organization are maintained in good condition. All entries will be made in indelible black ink. Errors will be corrected by drawing a single line through the error and entering the correct information. All corrections will be initialed and dated.

12.1.1 Sample Container Labels

Waterproof, gummed labels generated from the SAP database will display information such as the unique sample ID number, the name of the project, sample location, and analysis type. Labels will be completed and placed on the containers in the field before collecting the sample. Sample team members will provide information necessary for label completion. Such information may include sample date, time, preservative used, field measurements of hazards, and the sampler's initials.

12.1.2 Field Guidance Forms

Field guidance forms verifying unique sample numbers provided for each sample location can be generated from the SAP database. These forms contain the following information:

- Media
- Sample ID numbers
- Sample location
- Aliquot ID
- Analysis type
- Container size and type
- Sample preservation.

12.1.3 Field Logbooks

Field logbooks will be used to record information necessary to interpret the analytical data in accordance with the Sample and Analysis Management organization's format. The field logbooks will be controlled and managed according to applicable company policies and procedures.

12.1.3.1 Field Team Leader's Daily Logbook. A project logbook maintained by the FTL will contain a daily summary of the following:

- All field team activities necessary to reconstruct the events and methods used to accomplish the objectives of this LTMP
- Visitor log (a site visitor logbook may be assigned to record this information)
- List of site contacts
- Problems encountered
- Any corrective actions taken because of field audits.

This logbook will be signed and dated at the end of each day's sampling activities.

12.1.3.2 Sample Logbooks. Sample logbooks will be used by the sample team(s). Each sample logbook will contain information such as the following:

- Physical measurements
- All QC samples
- Sample information (i.e., sample location, sample collection information, analyses requested for each sample, sample matrix)
- Shipping information (i.e., collection dates, shipping dates, cooler ID number, destination, chain-of-custody number, and name of shipper).

12.1.3.3 Field Instrument Operation and Maintenance. The FTL logbook may be used to record the installation, calibration, maintenance, and downloading of instrumentation and dataloggers. The operation, calibration, and maintenance of monitoring instrumentation will be performed in accordance with the manufacturer's recommendations.

12.1.4 Photographs

It is not anticipated that formal photographic records of the activities will be made. Photographs may be taken by field personnel to record general equipment set-ups and installation procedures. A minimum of two copies will be made of any photographs taken during this project. One copy will be placed in the project file. The second copy will accompany other project documents (i.e., field logbooks) to be placed in the Document Control and Records Management files.

12.2 Document Revision Requests

Revisions to this, or any referenced document, will follow applicable company policies and procedures. Final changes must also be approved through the supervising Agencies, since this is a primary FFA/CO document (DOE-ID 1991).

13. REFERENCES

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